WHAT IS CLAIMED IS:

1. A powder molding apparatus, comprising:

a mold comprising a die having a powder molding space, and upper and lower punch units;

a compression driving mechanism for performing compression molding by driving said upper and lower punch units independently; and

molded article holding means for holding a molded article, formed by said compression molding, in a state separated from said die at a predetermined position.

2. A powder molding apparatus according to Claim 1, wherein said molded article holding means are configured so as to hold by engaging said molded article with one of said upper and lower punch units.

3. A powder molding apparatus according to either Claim 1 or 2, wherein said molded article holding means are configured so as to hold by engaging said molded article with a engaging piece provided on said die.

4. A powder molding apparatus according to any of the Claims 1 through 3, wherein said molded article holding means are configured so as to hold by engaging said molded

article with a guide member formed so as to encompass at least a part of said molded article.

5. A powder molding apparatus according to any of the Claims 1 through 4, wherein said molded article holding means are configured so as to hold by pressing said molded article with a pressing mechanism.

6. A powder molding apparatus according to any of the Claims 1 through 5, wherein said molded article holding means are configured so as to hold said molded article by pressure difference between fluid pressure and atmospheric pressure using a fluid pressure generating mechanism.

7. A powder molding apparatus, comprising:

a mold comprising a die having a powder molding space, and upper and lower punch units;

a compression driving mechanism for performing compression molding by driving said upper and lower punch units independently; and

punch positioning means for positioning said upper and lower punch units at said die.

8. A powder molding apparatus according to Claim 7, wherein said punch positioning means comprise:

a tapered block disposed on at least one of said upper and lower punch units; and

a tapered portion formed on said die;

where said punch positioning means are configured such that positioning is effected by tapered fitting of said tapered block to said tapered portion.

9. A powder molding apparatus according to Claim 8, wherein said tapered block is configured so as to be driven independently from said upper and lower punch units.

10. A powder molding apparatus according to Claim 7, wherein said punch positioning means comprise:

a positioning hole formed in said die; and

a guide pin having a point, formed on at least one of said upper and lower punch units;

where said punch positioning means are configured such that positioning is effected by fitting said point to said positioning hole.

11. A powder molding apparatus according to either Claim 8 or 9, further comprising depressurizing means for depressurizing by suctioning out air within said powder molding space, at said die or tapered block.

12. A powder molding apparatus according to Claim 11, said depressurizing means comprising:

a depressurizing channel formed so as to connect said die or tapered block with said powder molding space; and

a vacuum generating source connected to said depressurizing channel.

13. A powder molding apparatus according to Claim 11, wherein said tapered block is formed so as to envelop said powder molding space of said die and the surroundings thereof in an airtight manner, with said depressurizing channel being formed at said tapered block.

14. A powder molding apparatus according to any of the Claims 11 through 13, wherein said depressurizing means are configured so as to start depressurizing at the point that powder is supplied to said powder molding space, and maintain the state of depressurization until at least compression molding is performed.

15. A powder molding apparatus, comprising:

a mold comprising a die having a powder molding space, and upper and lower punch units;

a mold transporting mechanism for transporting said mold between at least a powder supplying stage, a

compressing molding stage, and a molded article extracting stage;

a compression driving mechanism for performing compression molding by driving said upper and lower punch units independently in said compressing molding stage; and

linking means for detachably linking at least one of said upper and lower punch units to said compression driving mechanism, by moving in a direction orthogonal to the compression driving direction of said upper and lower punch units.

16. A powder molding apparatus according to Claim 15, said linking means comprising:

a clamp main unit positioned and fixed on said compression driving mechanism;

a sliding claw movably supported on said clamp main unit in said orthogonal direction; and

a sliding driving mechanism for driving said sliding claw between a linking position for linking said punch unit to said compression driving mechanism and a non-linking position wherein said linkage is disengaged.

17. A powder molding apparatus according to Claim 16, wherein said sliding claw comprises a tapered portion for tapered fitting with said punch unit.

18. A powder molding apparatus according to either Claim 16 or 17, wherein said sliding driving mechanism is configured so as to linearly drive said sliding claw.

19. A powder molding apparatus according to either Claim 16 or 17, wherein said sliding driving mechanism is configured so as to rotationally drive said sliding claw.

20. A powder molding apparatus, comprising:

a mold comprising a die having a powder molding space, and upper and lower punch units;

a mold transporting mechanism for transporting said mold between at least a powder supplying stage, a compressing molding stage, and a molded article extracting stage;

a compression driving mechanism for performing compression molding by driving said upper and lower punch units independently in said compressing molding stage; and

unit holding means for holding said lower punch unit to said die when transporting between said stages, and disengaging said holding when transported to one of said stages.

21. A powder molding apparatus according to Claim 20,

said unit holding means comprising:

a guide mechanism for supporting said lower punch unit so as to be movable in the direction of compression; and

a holding mechanism for either fixing and holding or disengaging holding of said lower punch unit to said guide mechanism.

22. A powder molding apparatus according to Claim 21, said holding mechanism further comprising:

a fastening lever axially supported to said lower punch unit by a rotating shaft; and

a pressing member for causing plane contact of said fastening lever against said guide mechanism by rotationally pressing said fastening lever with said rotating shaft as the center thereof, so as to fix and hold said lower punch unit;

wherein said unit holding mechanism is configured such that said fixing holding is disengaged by rotating said fastening lever in a direction opposite to the direction of pressing.

23. A powder molding apparatus according to Claim 22, wherein a permanent magnet or an electromagnet is provided to said fastening lever to strengthen the force of fixing with said guide mechanism.

24. A powder molding apparatus according to Claim 21, said holding mechanism further comprising:

a fastening lever axially supported to said lower punch unit by a rotating shaft;

a permanent magnet for causing plane contact of said fastening lever against said guide mechanism by magnetic force for adsorption holding of said lower punch unit; and

an electromagnet wherein application of electricity thereto cancels the magnetism of said permanent magnet and weakens the adsorption force thereof.

25. A powder molding apparatus according to Claim 21, said holding mechanism further comprising:

a cam member movably supported on said lower punch unit; and

a pressing member which fixes by pressing said lower punch unit by friction from linear contact of said cam member against said guide mechanism;

wherein said holding mechanism is configured so as to disengage said pressing fixing by moving said cam member in a direction opposite to the direction of pressing.

26. A powder molding apparatus according to Claim 25, wherein said cam member is configured of a rotating cam

movably supported to said lower punch unit by a rotating pair.

27. A powder molding apparatus according to Claim 25, wherein said cam member is configured of a linear cam rotationally supported to said lower punch unit by a linear motion pair.

28. A powder molding apparatus, comprising:

a mold comprising a die having a powder molding space, and upper and lower punch units;

a mold transporting mechanism for transporting said mold between at least a powder supplying stage, a compressing molding stage, and a molded article extracting stage;

a compression driving mechanism for performing compression molding by driving said upper and lower punch units independently in said compressing molding stage;

molded article holding means for holding a molded article, formed by said compression molding, in a state separated from said die at a predetermined position;

punch positioning means for positioning said upper and lower punch units at said die;

linking means for detachably linking at least one of said upper and lower punch units to said compression driving

mechanism, by moving in a direction orthogonal to the compression moving direction of said upper and lower punch units; and

unit holding means for holding said lower punch unit to said die when transporting between said stages, and disengaging said holding when transported to one of said stages.

29. A powder molding apparatus according to Claim 20, said unit holding means comprising:

a guide mechanism for supporting said lower punch unit so as to be movable in the direction of compression;

a brake member provided independently from said guide mechanism; and

a holding mechanism for fixing and holding said lower punch unit to said brake member.

30. A powder molding apparatus according to Claim 29, said holding mechanism further comprising:

a fastening lever axially supported to said lower punch unit by a rotating shaft; and

a pressing member for causing plane contact of said fastening lever against said brake member by rotationally pressing said fastening lever with said rotating shaft as the center thereof, thereby fixing and holding said lower

punch unit;

wherein said holding mechanism is configured such that said fixing holding is disengaged by rotating said fastening lever in a direction opposite to the direction of pressing.

31. A powder molding apparatus according to Claim 30, wherein a permanent magnet or an electromagnet is provided to said fastening lever to strengthen the force of fixing with said brake member.

32. A powder molding apparatus according to Claim 29, said holding mechanism further comprising:

a fastening lever axially supported to said lower punch unit by a rotating shaft;

a permanent magnet for causing plane contact of said fastening lever against said brake member by magnetic force for adsorption holding of said lower punch unit; and

an electromagnet wherein application of electricity thereto cancels the magnetism of said permanent magnet and weakens the adsorption force thereof.

33. A powder molding apparatus according to Claim 29, said holding mechanism further comprising:

a cam member movably supported on said lower punch unit; and

a pressing member which fixes by pressing said lower punch unit by friction from linear contact of said cam member against said brake member;

wherein said holding mechanism is configured so as to disengage said pressing fixing by moving said cam member in a direction opposite to the direction of pressing.

34. A powder molding apparatus according to Claim 33, wherein said cam member is configured of a rotating cam rotationally supported to said lower punch unit by a rotating pair.

35. A powder molding apparatus according to Claim 33, wherein said cam member is configured of a linear cam linearly movably supported to said lower punch unit by a linear motion pair.

36. A powder molding apparatus according to Claim 15, wherein said die is installed on a die set, said upper and lower punch units comprise at least first and second punches, and said independent driving is performed by driving said first and second punches by a driving shaft, said powder molding apparatus further comprising:

linking means for linking said first and second punches to said die so as to relatively move in the compression

direction but so as not to fall; and

fixing means for collectively mounting and fixing said die to said die set along with said first and second punches.

37. A powder molding apparatus according to Claim 36, said linking means comprising

grooves formed on each of said first and second punch holders for said first and second punches, extending in the compression direction; and

engaging pins fixed up said die and said first punch holder;

wherein said linking means are configured such that the engaging pin of said die is engaged with the groove on said first punch holder, and the engaging pin of said first punch holder is engaged with the groove on said second punch holder.

38. A powder molding apparatus according to either Claim 36 or 37, wherein said fixing means are introduced between said die and die set, and are configured of a fixing bush for causing taper fitting of said die and die set.

39. A powder molding apparatus according to either Claim 36 or 37, wherein said fixing means are configured of

an actuator which presses and fixes said die to said die set with a pressing member introduced therebetween.

40. A powder molding apparatus according to either Claim 36 or 37, wherein said fixing means are introduced between said die and die set, and are configured of a fluid pressure fixing member which presses and fixes said die to said die set by pressurizing a pressure fluid filled therein.

41. A powder molding apparatus according to Claim 36, further comprising fastening means for detachably collectively fastening said first and second punches to said driving shaft.

42. A powder molding apparatus according to Claim 41, said fastening means comprising:

hook-shaped claw members erected on pressure rams of each of said driving shafts; and

engaging pins fixed on each punch holder of said first and second punches;

wherein said fastening means are configured so as to fasten said punch holders by engaging said engaging pins with said claw members.

43. A powder molding apparatus according to Claim 42,

wherein actuators are connected to each of said punch holders, configured such that said punch holders are collectively fastened to said pressure rams by said actuators.

44. A powder molding apparatus according to any of the Claims 36 through 43, wherein said die set is configured so as to transport said mold between a powder supplying stage, a compressing molding stage, and a molded article extracting stage.

45. A powder molding apparatus according to Claim 36, further comprising:

linking means for linking said first and second punches to said die so as to relatively move in the compression direction but so as not to fall;

fixing means for collectively mounting and fixing said die to said die set along with said first and second punches; and

fastening means for detachably collectively fastening said first and second punches to said driving shaft.

46. A powder molding apparatus according to claim 15 for forming a powder molding space with a die, and an upper punch unit and lower punch unit, said upper and lower punch

units disposed so as to face one another across said die, wherein compression molding is performed by driving each of said upper and lower punch units independently with driving shafts, and wherein upon one of said driving shafts is placed the other of said driving shafts, configured such that said other of said driving shafts moves synchronously with the movement of said one of said driving shafts.

47. A powder molding apparatus according to Claim 46, wherein said die is fixed to said upper and lower punch units and said upper and lower punch units comprise first and second punches respectively, and wherein said other of said driving shafts is placed upon a driving base moved and driven by said one of said driving shafts, configured such that moving said driving base causes said upper first and second punches and said lower first and second punches to move synchronously.

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48. A powder molding apparatus according to either Claim 46 or 47, wherein said die is disposed on a transporting table, and wherein said transporting table is configured so as to move between a powder supplying stage, a powder compressing stage, and a molded article extracting stage, in a direction orthogonal to the moving direction of said upper and lower punch units.

49. A powder molding apparatus according to Claim 15, said powder molding apparatus having a powder molding space formed with a die, and upper and lower punches disposed so as to face one another across said die, wherein driving shafts are connected to each of said upper and lower punches, and compression molding is performed by driving each of said upper and lower punches independently with said driving shafts by driving sources, and wherein upon said driving shafts are supported by a single base, with each of said driving sources being centrally disposed on said base.

50. A powder molding apparatus according to Claim 49, wherein said base is disposed below said die, and said die is disposed and fixed on a frame portion formed as an extension of said base.

51. A powder molding apparatus according to Claim 49, wherein said base is disposed below said die, said die is disposed and fixed on a transporting table provided separately from said base, wherein said transporting table is configured so as to move between a powder supplying stage, a powder compressing stage, and a molded article extracting stage.

52. A powder molding apparatus according to any of the Claims 49 through 51, wherein said upper end portion of said one driving shaft is linked to a upper mold supporting plate attached to said upper punch, so that said upper mold supporting plate is lowered with said one driving shaft while raising a lower mold supporting plate with said other driving shaft, by said driving sources, thereby effecting compression molding.

53. A powder molding apparatus according to any of the Claims 49 through 52, wherein said driving shafts are ball screws axially supported by said base, and said driving sources are servo motors linked to said ball screws by timing belts.

54. A powder molding apparatus according to Claim 15, forming a powder molding space with a die, and an upper punch unit and lower punch unit, said upper and lower punch units disposed so as to face one another across said die, wherein compression molding is performed by driving each of said upper and lower punch units independently with driving shafts, and wherein at least one of said upper and lower punch units is configured so as to allow insertion of at least first and second punches in a relatively movable manner, with first and second driving shafts linked to said

first and second punches, and said first and second driving shafts inserted in a hollow outer cylinder with the inner cylinder relatively movable in the axial direction.

55. A powder molding apparatus according to Claim 54, wherein said inner cylinder protrudes out from the openings at both ends of said hollow outer cylinder, with said first punch being linked to one end of said hollow outer cylinder by a first mold supporting plate and the other end thereof linked to a first driving source, and said second punch being linked to one end of said inner cylinder by a second mold supporting plate and the other end thereof linked to a second driving source, and wherein said hollow outer cylinder and inner cylinder are independently driven by said first and second driving sources.

56. A powder molding apparatus according to either Claim 54 or 55, wherein respective ball screws are linked to said hollow outer cylinder and said inner cylinder, and wherein servo motors serving as driving sources are linked to said ball screws by timing belts.

57. A powder molding apparatus according to any of the Claims 54 through 56, wherein said hollow outer cylinder is supported by a movable base, said inner cylinder is

supported by a fixed base, and said die is disposed and fixed on a frame portion integrally extended from said fixed base.

58. A powder molding apparatus according to any of the Claims 54 through 56, wherein said hollow outer cylinder and said inner cylinder are supported by a common movable base, said die is disposed and fixed on a transporting table provided separately from said movable base, and said transporting table is configured so as to move between a powder supplying stage, a powder compressing stage, and a molded article extracting stage.

59. A powder molding apparatus according to Claim 15, forming a powder molding space for supplying powder material to said die, said powder molding apparatus further comprising:

a powder storing unit to which a powder supplying tube is connected;

a powder injecting hole formed at a portion of the bottom wall of said powder storing unit facing said powder molding space; and

a scraping blade for sliding along said die to scrape away excess powder material outside said powder molding space, and also to close off said powder injecting hole.

60. A powder molding apparatus according to Claim 59, wherein the blade tip of said scraping blade is at an acute angle as to the surface of said die upon which scraping blade slides.

61. A powder molding apparatus according to either Claim 59 or 60, wherein said scraping blade is formed of a ceramic.

62. A powder molding apparatus according to any of the Claims 59 through 61, wherein a powder supplying opening of said powder supplying tube is positioned so as to be offset outwards from the center of said powder injecting hole, and also passes through the ceiling of said powder storing unit and is inserted to the inside thereof.

63. A powder molding apparatus according to any of the Claims 59 through 62, wherein a tapered portion is formed at an edge of said powder injecting hole so as to fit with the blade tip of said scraping blade when closing off said powder injecting hole.

64. A powder molding apparatus according to any of the Claims 59 through 63, wherein said scraping blade is

provided independently from said powder storing unit, passes through a slit formed in said powder storing unit and extends into said powder storing unit, and is driven to perform scraping action by an actuator disposed outside said powder storing unit.

65. A powder molding machine, comprising:

a transporting table which is configured so as to transport a mold, having a powder molding space, between at least a powder supplying stage, a compressing molding stage, and a molded article extracting stage; and

a powder supplying device for supplying powder material to the powder molding space in said mold, at said powder supplying stage;

said powder supplying device comprising

a powder storing unit to which a powder supplying tube is connected,

a powder injecting hole formed at a portion of the bottom wall of said powder storing unit facing said powder molding space, and

a scraping blade for sliding along said mold to scrape away excess powder material outside said powder molding space, and also to close off said powder injecting hole.